INDUSTRIAL GRADE ON-LINE UPS

SP SERIES

5KVA~ 20KVA

USER'S MANUAL

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♣♣ TESTING INSTRUMENT ♣♣

Item	Description	Brand	Model No.
A.	4 Channel Oscilloscope	Tektronix	TDS2014
B.	Power Quality Analyzer	Fluke	43B
C.	Digital Multimeter	Fluke	87IV
D.	2 Channel Memory Oscilloscope	HAMEG	HM205-3
E.	DC Current Meter 0-30A	YOKOGAWA	Y-30
F.	Distortion Meter (3~100KW)	GoodWill	201G
G.	AC Power Source 300~500VAC		
H.	Dummy Load		

1. SAFETY INSTRUCTION

1.1 Transport

Please transport the UPS system only in the original packaging (to protect against shock and impact).

1.2 Set-up

- Condensation may occur if the UPS system is moved directly from a cold to a warm environment. The UPS system must be absolutely dry before being installed. Please allow an acclimatization time of at least two hours.
- Do not install the UPS system near water or in damp environments.
- Do not install the UPS system where it would be exposed to direct sunlight or near heat.
- Do not block off ventilation openings in the UPS system's housing.

1.3 Installation

- Do not connect appliances or items of equipment which would overload the UPS system (e.g. Laser printers) to the UPS outlet socket
- Place cables in such a way that no one can step on or trip over them.
- Do not connect domestic appliances such as hair dryers to UPS output sockets.

1.4 Operation

- Do not disconnect the mains cable on the UPS system or the building wiring socket outlet (shockproof socket outlet) during operations since this would cancel the protective earthing of the UPS system and of all connected loads.
- The UPS system features its own, internal current source (batteries). The UPS output sockets or output terminals block may be electrically lived even if the UPS system is not connected to the building wiring socket outlet.
- Ensure that no fluids or other foreign objects can enter the UPS system.
- The UPS operates with hazardous voltages. Only qualified maintenance personnel may carry out repairs

1. SAFETY INSTRUCTION

1.5 Maintenance, servicing and faults

- The UPS system operates with hazardous voltages. Only qualified maintenance personnel may carry out repairs.
- ***Caution - risk of electric shock.*** Even after the unit is disconnected from the mains power supply (building wiring socket outlet), components inside the UPS system are still connected to the battery and are still electrically live and dangerous.
- Before carrying out any kind of servicing and/or maintenance, disconnect the batteries and verify that no current is present and no hazardous voltage exist in the terminals of high capability capacitor such as BUS-capacitors.
- Only persons are adequately familiar with batteries and with the required precautionary measures may replace batteries and supervise operations. Unauthorised persons must be kept well away from the batteries.
- ***Caution - risk of electric shock.*** The battery circuit is not isolated from the input voltage. Hazardous voltages may occur between the battery terminals and the ground. Before touching, please verify that no voltage is present!
- Batteries may cause electric shock and have a high short-circuit current. Please take the precautionary measures specified below and any other measures necessary when working with batteries:
  - remove wristwatches, rings and other metal objects
  - use only tools with insulated grips and handles.
- When changing batteries, install the same number and same type of batteries.
- Do not attempt to dispose of batteries by burning them. This could cause battery explosion.
- Do not open or destroy batteries. Escaping electrolyte can cause injury to the skin and eyes. It may be toxic.
- Please replace the fuse only by a fuse of the same type and of the same amperage in order to avoid fire hazards.
- Do not dismantle the UPS system.

2. INTRODUCTION

2.1 Thank you

Thank you for selecting this uninterruptible power supply (UPS). It is a state-of-the-art electronic UPS that uses the latest technology.

2.2 System Description

The SP-series UPS is advanced true on-line sinewave UPS which provided reliable regulated, transient-free AC power to sensitive equipment, ranging from computers & telecommunication systems to computerized instrument.

Because the UPS is a true on-line system, conditioned power is provided continuously to the connected device. Unlike the other standby UPS, the UPS is constantly regulating, filtering the output power. When incoming power is blackout, the UPS protects the computers instantaneously without any transfer time.

The SP-series UPS has high nonlinear load current capability (i.e. Crest Ratio 3:1) and this is suitable for powering special load such as switching power supplies.

The bypass function provides bypass power as its standby source. During an overload condition, the system will automatically transfer to the bypass line (if a good power exists) within 4 milliseconds to ensure the critical load in normal operation.

The system can transfer back to inverter automatically (when the overload condition has been cleared) within 4 milliseconds to ensure the critical load in normal operation.

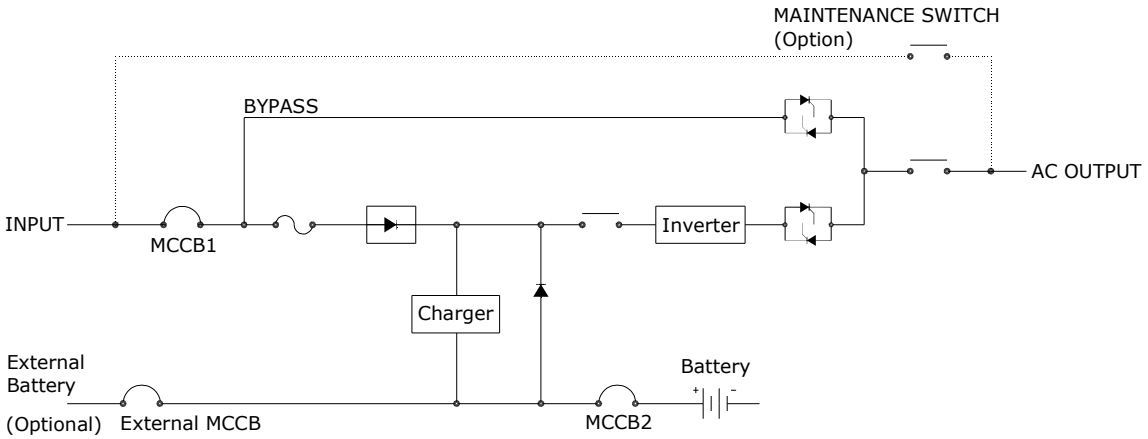
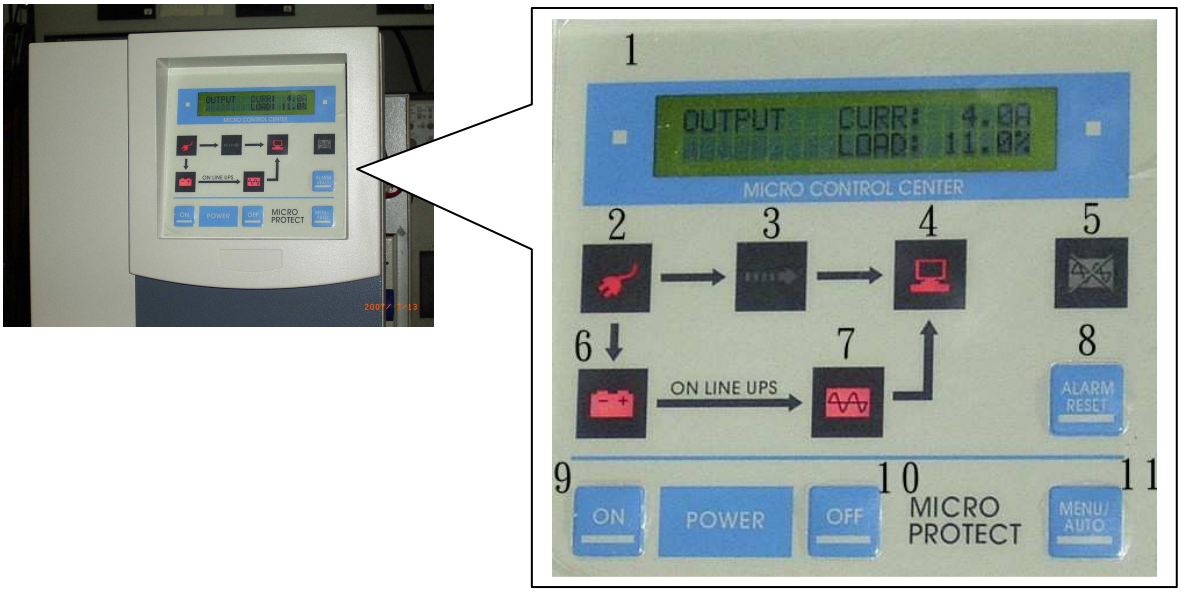


Figure 1-1 System Diagram

3. PANEL DESCRIPTIONS

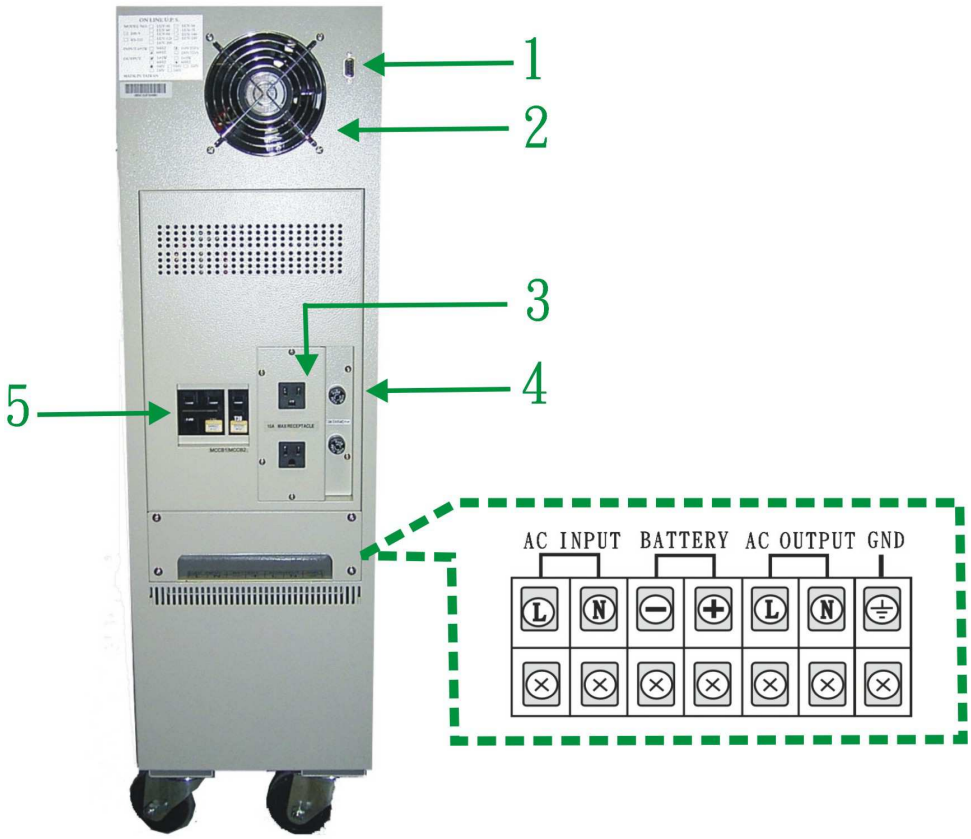


1. LCD STATUS DISPLAY: UPS monitor its function by itself; such monitoring messages are displayed in the MULTIPLE DISPLAY.
2. LINE / AC INPUT (Green): The Indicator is ON when the incoming utility power is available.
3. BYPASS (Amber): The indicator is ON when the UPS output power is supplied from the incoming power source.
4. LOAD (Red): When the load is over 100W, the indicator would illuminate. When it reaches over 100% load, UPS would emit an audible alarm sound continuously for 20seconds.
5. INVERTER FAULT (Red): The indicator is ON when UPS is in faulty condition and would emit continuous audible alarm sound.
   Note: When the unit is at fault condition, please refer to the paragraph 4. Table and figures.
6. BATTERY (Red): The indicator is ON under these situations:
   a) When AC main power fail,
   b) AC in under/over voltage
   c) Battery discharge reach to a low level, and automatically UPS would emit a quick alarm reminding that battery has a few energy can be used.
7. INVERTER (Green): The indicator is ON when the UPS Inverter is operating properly.

3. PANEL DESCRIPTIONS

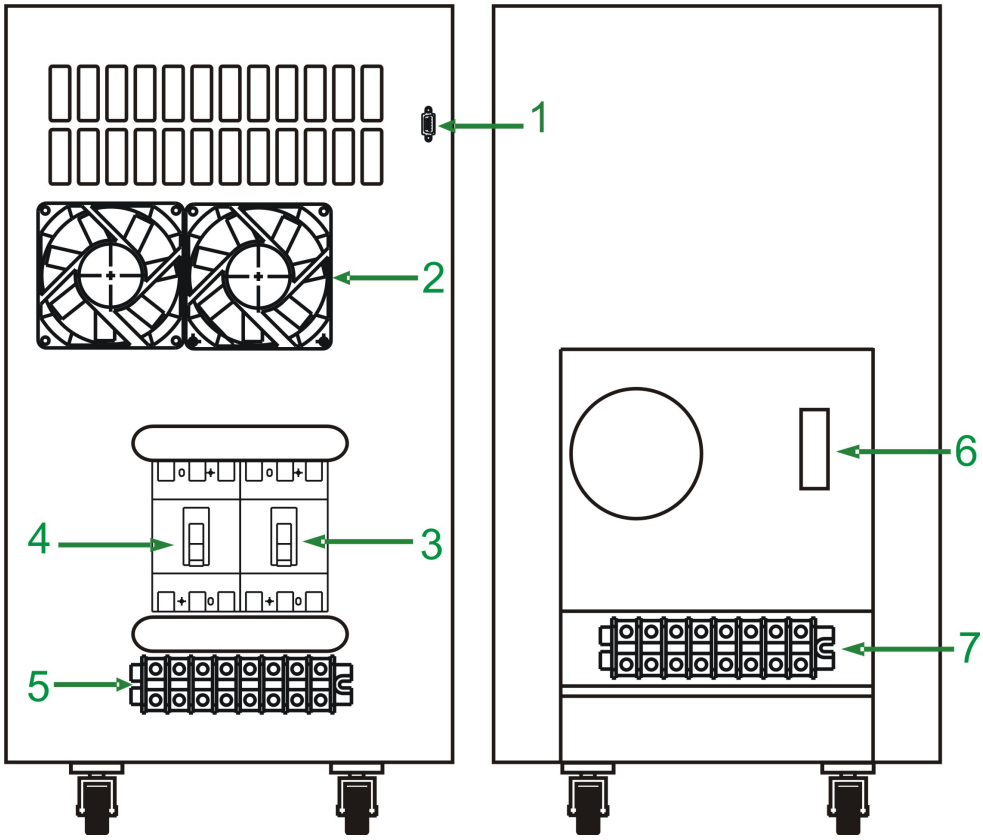
8. ALARM RESET : Press it to stop buzzer alarm.
9. POWER ON-Push Button: Press it to start the UPS.
10. POWER OFF-Push Button: Press it to shut down the UPS. If the AC mains exist, the unit will transfer itself to BYPASS output.
11. MENU/AUTO-Push Button: When press once at a time, it will display the following sequence of messages:
    a) Input Voltage / Frequency
    b) Output Voltage / Frequency
    c) Current / Percent of Load
    d) Battery Voltage / UPS Operating Temperature
        - When presses for 3 seconds, it will display above messages in an automatic cycle.

4. UNIT REAR VIEW (FOR SP-50~SP-80)



1. Communication Port (DB9 / RS232)
2. Ventilation Fan
3. Output Sockets
4. Output Fuse
5. MCCB: To control the AC Input and Battery voltage. The MCCB should be switched on to provide the UPS power.

4. UNIT REAR VIEW (FOR SP-100~SP-200)

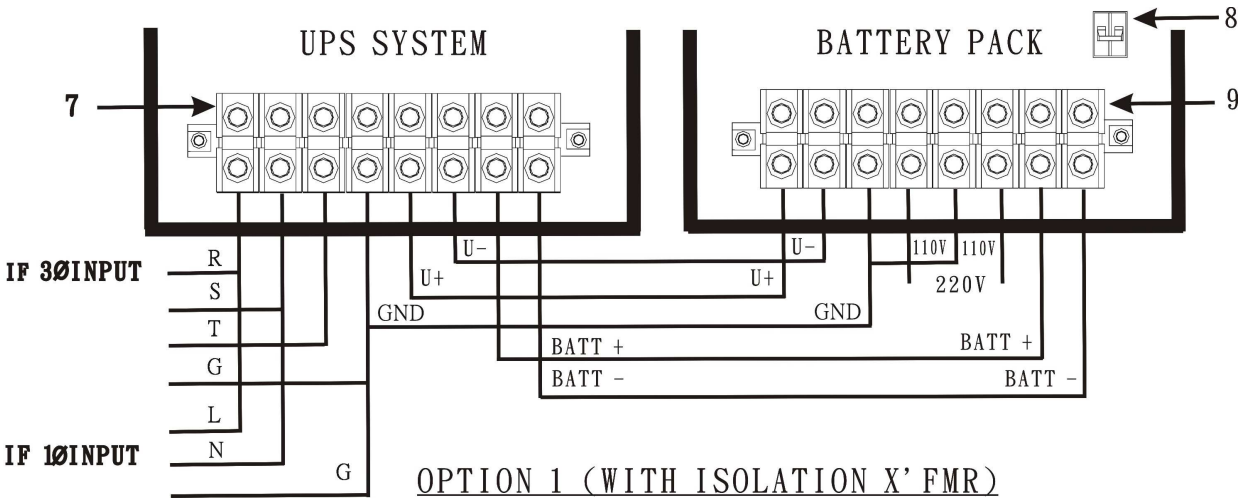


UPS SYSTEM **BATTERY PACK**

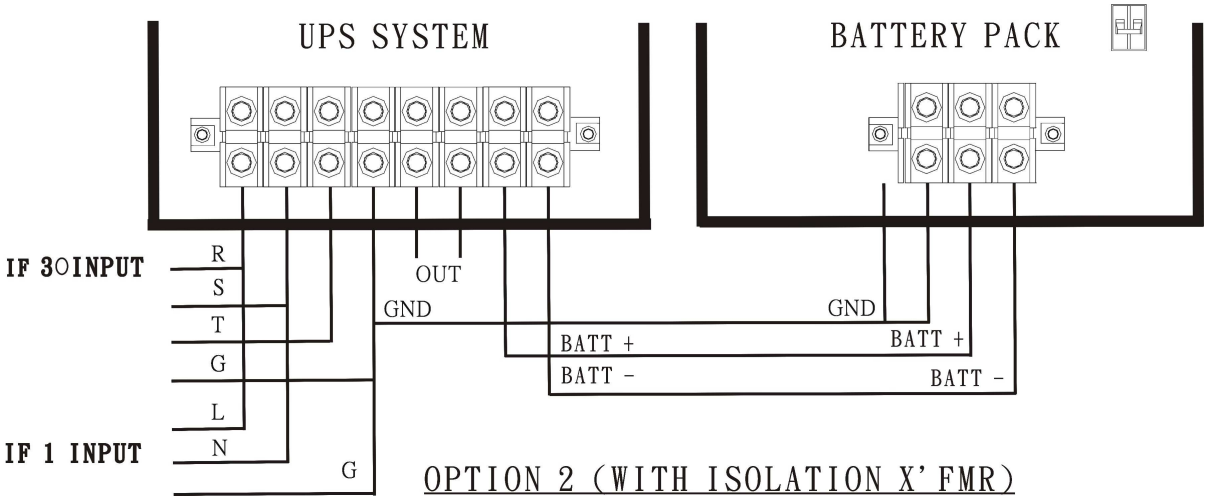
1. Communication Port (DB9 / RS232): UPS signal passes through DB9 enabling messages to be displayed into computer monitor.
2. Ventilation Fan
3. Bypass / No Fuse Breaker (MCCB2): Switch on when output power is supplied from bypass.
4. Inverter / No Fuse Breaker (MCCB1): Control the battery bus and rectifier voltage from AC Power input.
5. Terminal Block: To connect Input / Output connecting wires of power source and battery pack.
6. Battery / No Fuse Breaker at Battery Back
   a) Switch ON to generate battery power into UPS.
   b) Switch OFF ceasing the flow of battery power.
7. Terminal Block: Wires schematic diagram connecting battery pack and UPS.

4. UNIT REAR VIEW (FOR SP-100~SP-200)

*** Wiring Connection when input voltage is 3 phase system



OPTION 1 (WITH ISOLATION X'FMR)



OPTION 2 (WITH ISOLATION X'FMR)

5. INSTALLATION

The system may be installed and wired only by qualified electricians in accordance with applicable safety regulations!

5.1 Unpacking & Inspection

(1) Unpack the package and check the package contents. The shipping package contains:
- ★ A UPS
- ★ A User Manual

(2) Inspect the appearance of the UPS to see if there is any damage during transportation. Do not turn on the unit and notify the carrier and dealer immediately if there is any damage or lacking of some parts.

5.2 Notes for Installation

(1) The UPS must be installed in a location with good ventilation, far away from water, inflammable gas and corrosive agents.

(2) Ensure the air vents on the front and rear of the UPS are not blocked. It is recommended to retain 10cm from the wall.

(3) Condensation to water drops may occur if the UPS is unpacked in a very low temperature environment. In this case, it is necessary to wait until the UPS is fully dried inside out before proceeding installation and use. Otherwise, there are hazards of electric shock.

(4) Put the unit in a plain.

5.3 Installation & Starting

(1) Installation and wiring must be performed in accordance with the local electric code and the following instructions by professional personnel.

(2) For safety, please cut off the mains power switch before installation.

(3) Open the terminal block cover located on the rear panel of the UPS, please refer to the appearance diagram.

(4) Check the power requirement label at the rear panel of the UPS, use a Digital Multi-meter (DVM) to check the input and output voltage accord to your ordered specification.

(5) Find the battery breaker on the rear panel of battery bank and turn it on as well as MCCB1 and MCCB2. The indicators of “LINE”, “BYPASS”, “INVERTER” and “FAULT” will all light on. If AC mains exist, the fans on the rear panel operate with AC power outputs (BYPASS).

5. INSTALLATION

(6) Connect the input and output wires to the corresponding input and output terminals according to the following diagram.

Note：You must make sure that the input and output wires and the input and output terminals are connected tightly.

(7) Press the “ON” button on the front panel, the fan on the front panel operates, and UPS detect itself automatically at once. After 25 seconds, “BYPASS” extinguishes and “INVERTER” remains illuminating.

(8) Connect the input and output wires to the corresponding input and output terminals according to the following diagram. Use a Digital Multi-meter (DVM) to check the voltage.

NOTE: You must make sure that the input and output wires and the input and output terminals are connected tightly.

(9) The protective earth ground wire refers to the wire connection between the equipment which consumes electric equipment and the ground wire. The wire diameter protective earth ground wire should be at least as above mentioned for each model and green wire or green wire with yellow ribbon wire is used.

(10) To connect the load with the UPS, please turn off all the loads first, then perform the connection and finally turn on the loads one by one.

(11) No matter the UPS is connected to the utility power or not, the output of the UPS may have electricity. The parts inside the unit may still have hazardous voltage after turning off the UPS. To make the UPS have no output, power off the UPS, and then disconnect the utility power supply.

(12) The UPS now is ready for working, connecting the critical equipment to the output terminal blocks.

NOTE : a. Keep power continuously for 12 hours at the first start to ensure the battery fully charged. It is recommended to press “OFF” button on the front panel but open the circuit breaker MCCB1 during charging.

b Do not touch the external battery terminals, there is high DC voltage remains.

c Do not short-circuit wires at the external battery terminals block.

d Make sure the battery polarity is correct.

6. OPERATION

6.1 Check Prior to Start UP

(1) Ensure the UPS is in a suitable positioning.
(2) Check input cord is secured.
(3) Make sure the load is disconnected or in the “OFF” position.
(4) Check if input voltage meets the UPS rating required.

6.2 Start-up Procedure

(1) Turn on the circuit breaker.
(2) Push the “ON” switch on the front panel. (Blue color switch)
(3) Turn on the power breaker of your critical equipment.

6.3 Turn OFF Procedure

(1) Turn off all the power breakers on your critical equipment which are connected to the UPS.
(2) Press the “ON/OFF” buttons on the front panel.
(3) Turn off the NFB (MCCB1 & MCCB2) on the rear panel.

NOTE : a. The NFB can be kept in “ON” position to charge the batteries when the line input is normal.
b. For daily TURN ON / TURN OFF operation, it is recommended to keep the breaker turned on to ensure proper battery operation.

WARNING : If the breaker is in “ON” position, the line power will be supplied to outlets. Do not insert objects other than equipment power cords into the outlets.

6.4 Working

(1) When utility power is interrupted, the UPS converts the built-in battery source to protect your critical load from loss of data or damage.
(2) Battery back-up time is 10 - 15 minutes for full load and can be extended by removing non-critical loads.
(3) After utility power black-out, the audible alarm will sound every 4 seconds to show that output is backed-up by battery source.
(4) When audible alarm speeds up and sounds every 1 second, data should be saved and all loads should be shut down at once.

6. OPERATION

NOTE : a. Follow the application software in use as well as the computer manufacturer's instructions for saving data and turning off the computer.

b. After a blackout, keep the breaker (MCCB1) "ON" for at least 10 hours to ensure the batteries are fully recharged.

7. TROUBLE SHOOTING GUIDE

The Meaning of Indicators and Alarm

Indicators and Alarm							Status Condition	Recommended Solution
Line Input	INV	Battery	Bypass	Load	Fault	Buzzer		
ON	ON	ON	OFF	----	OFF	NO	Normal	
OFF	ON	Flashing	OFF	----	OFF	Every 4 sec.	Normal, AC mains failure. UPS is charging batteries.	Close your software and files in use.
ON	OFF	ON	ON	----	ON	NO	UPS works on BYPASS	Press “ON” the Main Switch on the front panel first
---	---	ON or Flashing	----	ON	OFF	Conti-nuous	UPS is at overload condition	Remove nonessential load equipment.
OFF	ON	Flashing	OFF	ON	OFF	Every 1 sec.	Normal, battery will discharge completely.	Close your files and software in use.
---	ON	ON	OFF	ON	OFF	Conti-nuous	The output circuit is shorted.	Remove the short circuit and start the UPS again.
ON	---	ON	---	----	OFF	Conti-nuous	UPS works on INV. or BYPASS, while the input voltage is more than 270V	Warming only without affecting UPS operation.
---	ON	ON or Flashing	OFF	ON	ON	Conti-nuous	UPS interior gets too hot as it has been worked on INV. for a period of time.	UPS will transfer to BYPASS mode.
ON	---	ON	---	----	OFF	Conti-nuous	UPS works on INV. or BYPASS.	Call for service, if UPS works on INV.. Whereas, the UPS work on BY-PASS is because the AC voltage is too high.

8. CUSTOMER SERVICE

There are no serviceable components inside. Do NOT open the cover or attempt to service the unit. High voltage may remain even when the unit is shutdown. Unauthorized service will void the warranty and may cause serious injury.

8.1 Maintenance

The unit is designed for easy maintenance. Only a little customer maintenance is required. The following works will keep ensure trouble-free operation.

(1) Vacuum the dust from the ventilation in-take on the front panel.

(2) Wipe the cover with a damp cloth.

(3) Periodically switch off the AC supply to the UPS to check the operation of the UPS and the battery condition (Before testing, be sure to save any data files in use).

(4) Cautions:

a. Follow the instruction manual to operate it.

b. After a power failure, keep power applied continuously to the UPS for at least 12 hours to ensure that the batteries are fully recharged.

c. After total battery discharge, the UPS will automatically shutdown by itself to protect the batteries from over discharge. When the incoming power recover, the UPS will reset automatically.

(4) Storage Instructions:

a. Leave the UPS plugged in for 24hours prior to storage.

b. Store the UPS in a cool, dry environment (Below 80℉ / 27℃).

c. Remove from storage and repeat step 1 every 90days.

d. Disconnect the power cord from the AC supply socket during storage.

8.2 Trouble Shooting

Due to the unique design, the unit must be serviced by authorized person only. If the UPS fails to operate properly, turn off the power first and review the following check list. Be prepared to answer the following question before calling for service.

(1) Is the AC supply power rating correct?

(2) Is the power cord connection loose?

(3) Turn ON the Main Switch again. Does the UPS return to normal operation?

(4) Did a power failure occur just after or before the malfunction was noted?

8. CUSTOMER SERVICE

(5) What is the status of the indicator at the time of the malfunction? And on restarting the UPS?

(6) Where any changes made to the UPS or the critical device attached to the unit?

(7) Did overload condition happen? If so, remove non-critical loads from the unit and go through the restart procedure.

(8) In addition, check the fuse or breaker on the rear panel. Is the fuse busted or the circuit protector tripped? If the UPS fails to operate normally after carrying out these checks, contact our local service representative. Please note down the following information before you call for service:

a. Model number & serial number.

b. Date of problem

c. Full descriptions of problem

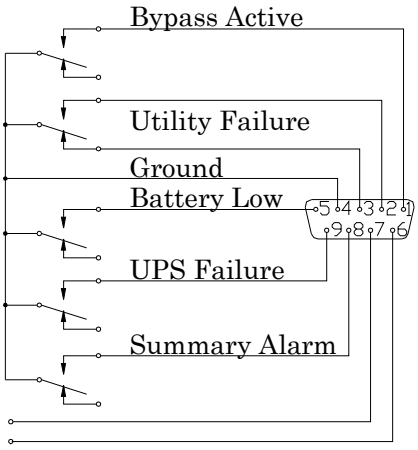
9. COMMUNICATION PORT

Power management software and interface kits can be used with this UPS. Use only kits supplied or approved by the manufacturer. If used, connect the interface cable to the 9-pin computer interface port on the back panel of the UPS. Secure the connector's screws to complete the connection.

Note: Computer interface connection is optional. The UPS works properly without it.

(1) DB-9 Interface

The following is the pin assignment and description of DB-9 Connector:



PIN1 (Close) : Bypass Active
(Open) : UPS ON
PIN2 (Close) : Utility Failure (N.O.)
PIN3 (Close) : Utility Failure (N.C.)
PIN4 (Ground)
PIN5 (Close) : Battery Low
PIN6 Auto Cut Off
PIN7 Auto Cut Off
PIN8 Close : Summary Alarm
PIN9 Close : UPS Failure

(2) RS-232 Interface

Baud Rate:	2400bp
Data:	8bit
Stop:	1bit
Parity Bit:	None

The following is the pin assignment and description of RS-232 Connector:

PIN#	DESCRIPTION	I/O
6	RS232 Rx	INPUT
9	RS232 Tx	OUTPUT
7	Ground	INPUT

10. PRODUCT SPECIFICATION

10.1 Electrical Specifications

Model		SP-50	SP-60	SP-80	SP-100	SP-150	SP-200
Capacity (KVA)		5	6	8	10	15	20
Input	Voltage	180V~280V (230V) / 90V ~149V (115V)					
	Frequency	50 or 60Hz ± 5%					
	Phase	1Ø 2W+G / 3Ø 3W+G / 3Ø 4W+G (as client demand)					
	Power Factor	0.8 to 1 lagging					
Output	Voltage	115V or 230V ± 2%					
	Phase	1Ø 2W+G (as client demand)					
	Voltage Regulation	± 1% at liner load					
	Frequency	50 or 60Hz ± 0.5Hz					
	Waveform Distortion	Pure sinewave less than 3% at full load.					
	Crest Factor	3 : 1					
	Overload Capacity	100%-124% continuous, 125% -150% for 25 seconds.					
	Efficiency AC-AC	>80% at battery fully charge					
Battery	Type	rechargeable, sealed maintenance-free					
	Back up Time	10 min. at full load and 25 min. at half load.					
	Recharge Time	4-8 hours 90% after fully discharge.					
Transfer Time	Bypass to UPS	No break					
	UPS to Bypass	No break.					
Indicator	LCD Display	Input/Output & Battery Voltage, Frequency, Output Load, Operation Temperature					
	LED Display	Mimic display					
Audible	Mains Fail	Sounds every 4 seconds after line fails.					
	Battery low	Sounds every second when approaches battery low level.					
	UPS fault	Continuous alarm.					
Protection	Short Circuit	When a short circuit occurs, the UPS will not transfer to Bypass but emit a sustained tone. Once the short circuit is removed, the tone stops and the whole system operates normally again. The UPS stops supplying power if the period of a short circuit is longer than 3 seconds.					
		Lightning : Yes. Surge : Yes.					
W*H*D / (mm)	UPS	270*800*660		310*900*660		360*740*870	
	Battery Bank	-----		-----		360*740*870	
Net Weight (kgs)	UPS	130	160	190	320	190	230
	Battery Bank	-----	-----	-----	-----	200	200

10.2 Physical Specifications

Relative Humidity :	90% maximum at 25°C non-condensing.	
Audible Noise :	55dB, ANSI A scale at 3 feet.	
Operating Altitude :	(Above sea level)	Operating Temperature
	0-4,800ft	40°C (104°F)
	4,800-7,000ft	38°C (100.4°F)
	7,000-10,000ft	35°C (95°F)